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## NOTE ON THE AUSTRALIAN PUPIDÆ.

BY HENRY A. PILSBRY.

To ascertain the geographic range of the genus *Bifidaria* I was led to examine the Australian species in the collection of the Academy, and as no author seems to have indicated their place in the system, it may be as well to put the facts on record.

Four genera of the family *Pupidæ* are represented, of which one, *Cylindrovertilla*, has been found in Australia and New Caledonia only, the others being widely distributed.

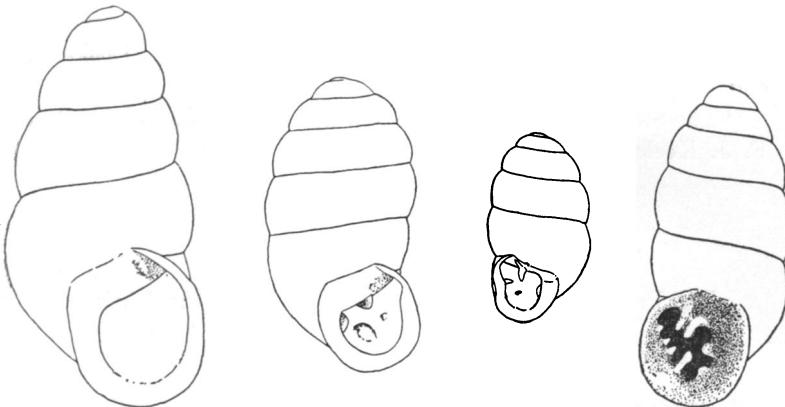


Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 1. *Pupoïdes pacificus* (Pfr.), Facing Isl., Queensland. Fig. 2. *Pupa ficalnea* Tate, Palm creek, central Australia. Fig. 3. *Cylindrovertilla kingi* (Cox), Sydney, N.S.W. Fig. 4. *Bifidaria strangei* (Pfr.), Narrabri, N. S. Wales.

## Key to Genera.

a.—Aperture toothless except for a nodule (angle lamella) usually developed at the posterior angle; peristome expanded or reflexed; shell brown, tapering above, *Buliminus*-shaped, **PUPOÏDES** (fig. 1).

*a<sup>1</sup>.*—Aperture with a parietal and a columellar lamella, and one or two palatal folds, or toothless; form cylindric, blunt at the ends, the whorls narrow, hardly oblique, *PUPA* (fig. 2).

*a<sup>2</sup>.*—Angle lamella developed, no parietal; a small columellar lamella and upper palatal fold. Sinistral and minute, *CYLINDROVERTILLA* (fig. 3).

*a<sup>3</sup>.*—Angle lamella and a more immersed parietal lamella developed, the two converging and usually more or less united; a columellar lamella and two or three palatal folds generally present. Shell whitish, teeth white, *BIFIDARIA* (fig. 4).

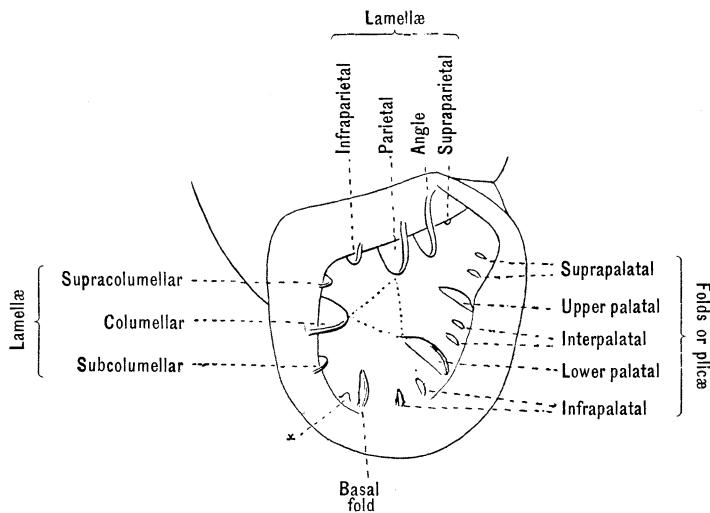


Fig. 5. Nomenclature of lamellæ and folds.

The nomenclature of folds is indicated in Fig. 5. The palatals may be identified, when the normal number of three is reduced, by remembering that the lower palatal fold is about equidistant from the columellar and parietal lamellæ, and straight lines connecting these three teeth form an approximately equilateral triangle. There are sometimes accessory folds within the lip, designated infrapalatal, interpalatal or suprapalatal, according to their positions.

I have confined my observations on Australian species to those in the collection of the Academy, referring merely to Dr. Cox's Monograph, Mr. Smith's paper on Western Australian shells, and Prof. Tate's report on the Horn Expedition for confirmation of the identifications. A wider reference to the literature would

probably increase the number of species, but is unnecessary for my present purpose.

Genus **PUPOIDES** Pfr., 1854.

Besides its distribution in the two Americas and Antilles, this genus is represented in southern Asia (*P. caenopictus*, *P. lardeus*), in tropical Africa (*P. senegalensis*), and in Australia, where it is represented by *P. pacificus* Pfr., *P. adelaidæ* A. and A., *P. contrarius* Smith, *P. ischnus* Tate, and I suppose *P. lepidulus* A. and A. (described as *Chondrula*), and *P. myoporinæ* Tate, the latter two not known to me by specimens.

Some Australian and African species are sinistral, and at least one, *P. contrarius* Smith, either sinistral or dextral. Prof. Tate's *P. ischnus* is perhaps the most aberrant of the Australian group, but they all seem closely allied.

Genus **PUPA** Drap., 1801.

The Australian species exhibit the common characters of this genus, which, though wanting in Polynesia and South America, is pretty generally distributed elsewhere. Even when toothless, like the original type of *P. muscorum*, the contour of the shell readily distinguishes it from *Pupoides*. Generally a parietal and a columellar lamella and the lower palatal fold are developed, frequently the upper palatal also, in Australian forms.

*Pupa australis* A. and A., *P. ficalnea* Tate and *P. lincolniensis* Cox belong here, and also, judging from description and figure, *P. nelsoni* Cox.

Genus **CYLINDROVERTILLA** Boettger, 1881.

The arrangement of folds is quite peculiar in this group, which was founded for the New Caledonian *P. fabreana* Crosse. The single lamella upon the parietal wall is not the usual parietal lamella, but the supraparietal or angle lamella; and the larger denticle on the palatal side is apparently the upper palatal fold rather than the usually persistent lower palatal.

*C. kingi* Cox, the only Australian species, is shorter, more oval than *fabreana*, but both species are alike in being sinistral and quite minute. The dentition varies somewhat, a lower palatal fold often being developed.

Genus **BIFIDARIA** Sterki, 1889.

The converging, often united, angle and parietal lamellæ, and the whitish shell with white teeth are characteristic. The extra-Australian distribution of the genus is wide, though less extended than that of *Pupa* or *Pupoides*. In America the greatest modifications as well as most species occur; but in eastern Asia, from Japan to India, it occurs, and *B. pediculus*, or slight modifications thereof, are widely spread in Polynesia and the East Indies.

The Australian group of species is closely allied to *B. pediculus*, and falls into the typical section of *Bifidaria*. Some American forms, such as *B. prototypus* Pilsbry and *B. dalliana* Sterki, are very similar, though in most other American, as well as the Chinese forms of the typical section of *Bifidaria*, the angle lamella and parietal lamella are more intimately united, forming a single sinuous, bifid, or emarginate lamella. But this varies by easy stages from complete union to separation of the lamellæ.

Some of the Australian species, like *B. larapinta* Tate and *B. rossiteri* Braz., have the form of the American *B. procera* group, with teeth like *B. prototypus*, while others are rather more conic. *B. strangei* Pfr. is usually sinistral, but not aberrant in dentition. In *B. mooreana* Smith the angle lamella is much reduced or even absent, a reduction parallel to what has taken place in the American *B. pilosbryana* and *B. pentodon*.

I have not seen *P. wallabyensis* Smith, *P. macdonnelli* Braz., *P. margaretae* Cox, and *P. moretonensis* Cox, species probably referable to *Bifidaria*; the latter two certainly belonging there.

The occasional presence of an infraparietal lamella in some Australian species is unlike most of the Americans, in which this tooth is very rarely developed.

I do not regard *Bifidaria* as related to the Polynesian groups of which *P. lyrata* Gld. and *P. tantilla* Gld. are representatives, further than by the general bond of common ancestry which connects *Bifidaria*, *Hypselostoma*, *Torquilla*, *Faula* and these Polynesian forms.

*Summary.*—Three of the four Australian genera of *Pupidae* are common to that continent and Indo-China, extending thence to Africa and America, and one (*Pupa*) to Europe. One genus, *Bifidaria*, is represented also in Polynesia by the widely spread species

*pediculus*.<sup>1</sup> The only local group is *Cylindrovertilla* which occurs elsewhere in New Caledonia. There is no "Antarctic" type in the *Pupidae*. So far as their Australian distribution is concerned, the *Pupidae* agree with the Epiphallogonous Helices and probably reached Australia by the same land connection and at the same time, from the northward.

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<sup>1</sup> Probably the range of *B. pediculus* has been greatly extended by human agency.